

**INTERAMERICAN UNIVERSITY OF PUERTO RICO
METROPOLITAN CAMPUS
DOCTORAL ENTREPRENEURIAL AND MANAGERIAL
DEVELOPMENT**

I. TITLE	MANAGERIAL ECONOMETRICS
COURSE NUMBER	BADM 7225
CREDITS	3
PREREQUISITES	BADM 7201 QUANTITATIVE METHODS 1 BADM 7202 QUANTITATIVE METHODS 11

II. COURSE DESCRIPTION

Analysis and construction of econometric models of micro and macroeconomics utilizing transversal data and historic series. Analysis of both stationary and non-stationary historical series, using econometric methods and computer software.

III. OBJECTIVES

After completion of this course the student should be able to attain the following terminal and capacitating objectives:

1. Construct structural econometric models to explain economic and organizational behavior.
 - 1.1 Define an econometric model of an economic or organizational theory or hypothesis. Differentiate between deterministic and stochastic models.
 - 1.2 Explain the importance of the disturbance term and its role in the model.
 - 1.3 Define structural correctness.
 - 1.4 Define model specification.
 - 1.5 Evaluate the model using structural correctness criteria.
2. Estimate and statistically evaluate econometric models.
 - 2.1 Define the estimation methods: least squares and maximum likelihood.
 - 2.2 Explain the characteristics of the estimators.
 - a. Unbiasedness
 - b. Efficiency

- c. Consistency
 - d. Mean squared error (MSE)
- 2.3 Define and explain the Gauss-Markov theorem.
- 2.4 Use observed data and Excel to estimate the multiple regression model.
- 2.5 Evaluate the model statistically using p-values, t tests, R^2 and ANOVA table.
- 2.6 Evaluate the normality assumption using the Jarque-Bera (JB) test.
- 3. Perform diagnostic tests on the estimated model to see if it violates critical assumptions of the disturbance term, and if so, correct the model.
 - 3.1 Diagnose for autocorrelation using the following tests: Durbin-Watson, Runs test, h of Durbin, Theil Nagar, Asymptotic, Lagrange ML, Von-Neumann ratio, Breush-Godfrey, Berenblutt-Webb and Q statistic-Box-Pierce
 - 3.2 Evaluate and use correctly the following methods for correcting autocorrelation:
 - a. Iterative Cochrane-Orcutt
 - b. Durbin-Watson d
 - c. Theil-Nagar
 - d. Durbin two stage
 - e. Iterative Hildreth-Lu
 - 3.3 Diagnose for heterokedasticity using the following tests: Bartlett, Park, Glejser, Spearman, Goldfeld-Quandt, Breush-Pagan-Godfrey, and White.
 - 3.4 Evaluate the structure of the estimated model using Ramsey's RESET, PRESS, Lagrange ML, and Durbin-Watson tests.
 - 3.5 Evaluate for simultaneity and exogeneity using the Hausman test.
 - 3.6 Evaluate the model for multicollinearity using intuitive methods and the Conditional Index
 - 3.7 Apply dummy variables for non quantitative regressors.
 - 3.8 Differentiate between the different logarithmic models.
- 4. Apply the Generalized Least Squares model to simultaneously solve estimation problems.
 - 4.1 Define Aitken's Generalized Least Squares.
 - 4.2 Evaluate the empirical problems of the method.
- 5. Apply regression models to time series analysis
 - 5.1 Autoregressive schemes
 - 5.2 Stationarity
 - 5.3 VAR
 - 5.4 Cointegration

6. Estimate simultaneous equations systems.

6.1 Explain the identification problem.

6.2 Evaluate the following estimating techniques to estimate structural models: Ordinary Least Squares (OLS), Weighted Least Squares (WLS), Indirect Least Squares (ILS), Two Stage Least Squares (2SLS), Three Stage Least Squares, Instrumental Variable (IV) and Maximum Likelihood (ML).

IV. COURSE CONTENT

Part I. Structural Econometric Models

A. Structure of models

1. Variables and equations
2. Deterministic vs. stochastic
3. Functional relations
4. Disturbance term

B. Structural correctness criteria

1. Variables included
2. Number of equations
3. Functional forms
4. Normality assumption
5. White noise vs. systematic errors variations

Part II. Model Estimation and Evaluation

A. Estimating Techniques

1. Minimum Least squares
2. Maximum likelihood
3. Excel Solver and regression output

B. Statistical evaluation of estimated model

1. Gauss-Marcov theorem
2. Normality assumption
3. p-values, t tests, F test and ANOVA table

Part III. Residual Analysis, Diagnostics and Corrections

A. Autocorrelation

1. Diagnostics
 - a. Durbin-Watson,

- b. Runs test
- c. Durbin's h
- d. Theil Naga
- e. Lagrange ML
- f. Von-Neumann
- g. Breush-Godfrey
- h. Berenblutt-Webb
- i. Q statistic- Box-Pierce

- 2. Correction
 - a. Iterative Cochrane-Orcutt
 - b. Durbin-Watson d
 - c. Theil-Nagar
 - d. Durbin two stage
 - e. Iterative Hildreth-Lu

B. Heterokedasticity

- 1. Diagnostics
 - a. Bartlett
 - b. Park
 - c. Glejser
 - d. Spearman
 - e. Goldfeld-Quandt
 - f. Breush-Pagan-Godfrey
 - g. White.
- 2. Correction
 - a. Proportionality in variance
 - b. Inverse variance relation

C. Multicolinearity

- 1. Diagnostics
 - a. Intuitive methods: R^2 , correlation matrix, matrix determinant
 - b. Conditional Index
- 2. Correction
 - a. New information
 - b. Instrumental variable (IV)

D. Model evaluation

- 1. Structure
 - a. Ramsey's RESET
 - b. PRESS
 - c. Lagrange ML

- d. Durbin-Watson
- 2. Simultaneity and exogeneity: Hausman test

Part IV. Model Extensions

- A. Non quantitative variables: dummy variables
 - 1. Intercept change
 - 2. Slope change
 - 3. Interactive effects

- B. Logarithmic regression
 - 1. Log-lin
 - 2. Log-log
 - 3. Lin-log

- C. Reciprocal regression
- D. Constant suppression
- E. Aitken's Generalized Least Squares
- F. Bootstrapping method
- G. Using panel data
- H. Time Series Models and Forecasting
 - 1. Distributed Lag Models
 - 2. Stochastic Properties of Variables (stationarity, ergodicity)
 - 3. ARIMA Models (Autoregressive, Integrated, Moving Average Models)
 - 4. Forecasting
 - 5. Vector autoregressions (VAR)
 - 6. Unit Roots and Nonstationarity
 - 7. Cointegration

Part V. Simultaneous Equation Model

- A. Identification problem
 - 1. Reduced form equations
 - 2. Reduced form parameters
 - 3. Necessary and sufficient conditions
 - 4. Just identified, under identified and over identified models

- B. Estimating techniques
 - 1. Ordinary Least Squares (OLS)
 - 2. Weighted Least Squares (WLS)

3. Indirect Least Squares (ILS)
4. Two Stage Least Squares (2SLS)
5. Three Stage Least Squares
6. Instrumental Variable (IV)
7. Maximum Likelihood (ML)

V. COURSE ACTIVITIES

- A. Power Point presentations by professor and student feedback
- B. Class discussion of exercises
- C. Communication among students and professor via e-mail

VI. EVALUATION CRITERIA

- A. Partial Examinations: There will be two partial examinations.
- B. Final Examination
- C. Research Paper

All examinations will consist of questions that require detailed problem-solving work. Approximately 40% of the exam questions are based on the examples discussed in class presentations. Another 60% of the exam questions are based on homework problems. All examinations are closed notes. However, you are allowed to bring in two 3.5 inches index cards, upon which you may write useful formulas, equations, and so forth for each of the mid-term exams, and three 3.5 inches index cards for the final. In addition, please bring a calculator with exponential and logarithmic functions (including y^x). The use of Excel will be needed for the solution of some exercises.

There will be no exam repositions or make-ups.

The final examination is scheduled to last for four hours. Final examination will be comprehensive and will cover the entire course contents with emphasis in the applications of methods.

The research paper must use data to estimate a model and apply at least three statistical techniques studied in class. Use of Excel or other statistical program is required. Graphs are required to illustrate your data and findings. The length of the paper, excluding tables and graphs should be at most 15 pages (Times New Roman, 12, doubled spaced) in Microsoft Word format. The paper is a relatively short exercise designed for you to gain some detailed knowledge about a given subject, to give you some experience in empirical research, and to give you some practice in the use of various econometric techniques. In the project you will be formulating an economic, marketing or organizational hypothesis and using econometric analysis in attempting to disprove the hypothesis. You should learn as much as possible about your question and your main dependent variable, including the theory behind the question, where the data for the variable comes from, how it is collected and put together, what it measures, its time series history, what determines the variable, and the student's best forecast of what the variable will do over

the next two years. There will be a project proposal due before the second partial exam. The proposal will be a one page summary describing your project, listing your data series and presenting a short bibliography of relevant books or articles. The project is due one week before the end of the semester.

Final Grade

Your total course score will be determined by weighting the two partial exams by 15% each, the final exam by 50% and the research paper 20%. The weights of the partial and final exams can be interchanged in the student's favor.

The final grade distribution will be based upon the following scale:

100-85----A
84-72-----B
71-60-----C
<60-----F

The professor could add a maximum of three percentage points to your final score for class participation.

VII. EDUCATIONAL RESOURCES

Required Texts

Gujarati, Damodar D.: **Basic Econometrics**. W/Software Disk 4th Ed. McGraw-Hill Co. 2003.

Montgomery, Douglas C., Peck, Elizabeth A. and Vining, Geoffrey C.:
Introduction to Linear Regression Analysis, 3rd ed., John Wiley & Sons, NY, 2001

Journals

Journal of Applied Econometrics, Wiley InterScience.

Significance, Blackwell Publications

VIII. BIBLIOGRAPHY

Robert S. Pindyck and Daniel L. Rubinfeld, **Econometric Models and Economic Forecasts**, Fourth Edition, Irwin/McGraw-Hill, 1998

James H. Stock, Mark W. Watson, **Introduction to Econometrics**, Addison Wesley;

2nd ed., 2006

Wooldridge, Jeffrey M. *Introductory Econometrics: A Modern Approach*, 2E. South-Western College Publishing, 2003. (W)

Greene, William. *Econometric Analysis*. 5th Ed. Prentice Hall Co. 2003

Ramanathan, R., **Introductory Econometrics**. Fifth Edition, San Diego: Harcourt Brace Jovanovich, 2002. (A good, modern introductory text)

Maddala, G.S. *Introduction to Econometrics*. 3rd Ed. John Wiley & Sons, 2001. (M)

William E. Griffiths, R. Carter Hill and George G. Judge (GHJ), **Learning and Practicing Econometrics**, chapters 20 and 21

Ramanathan, R., **Introductory Econometrics**, chapters 11

Enders, Walters., **Applied Econometric Time Series**, chapters 2 and 6

Nelson, Charles R. and H. Kang, "Pitfalls in the Use of Time as an Explanatory Variable in Regression," **Journal of Business and Economic Statistics**, 2 (1984) 73-82.

Nelson, Charles R., "The Interpretation of R² in Autoregressive-Moving Average Time Series Models," **The American Statistician**, 30 (1976) 175-180.

Schwert, G. William, "Effects of Model Specification on Tests for Unit Roots in Macroeconomic Data," **Journal of Monetary Economics**, 20 (1987) 73-103.

Schwert, G. William, "Tests for Unit Roots: A Monte Carlo Investigation," **Journal of Business and Economic Statistics**, 7 (1989) 147-159

Zellner, Arnold and Franz Palm, "Time Series Analysis and Simultaneous Equation Econometric Models", **Journal of Econometrics**, (June 1974) 17-54.

Nelson, Charles R. and G. William Schwert, "Tests for Predictive Relationships Between Time Series Variables: A Monte Carlo Investigation," **Journal of the American Statistical Association**, 77 (March 1982) 11-18.

Bell, William R. and Steven C. Hillmer, "Issues Involved With the Seasonal Adjustment of Economic Time Series," **Journal of Business and Economic Statistics**, 2 (October 1984) 291-320.

Lorek, K. S., C. L. McDonald, and D. H. Patz, "A Comparative Examination of Management Forecasts and Box-Jenkins Forecasts of Earnings", **The Accounting Review**, (April 1976) 321-330.

Schwert, G. William, "Why Does Stock Market Volatility Change Over Time?" **Journal of Finance**, 44 (December 1989) 1115-1153.

Chatfield, Chris, "Calculating Interval Forecasts," **Journal of Business and Economic Statistics**, 11 (1993) 121-135.

Hanssens, Dominique M. (1980), "Bivariate Time Series Analysis of the Relationship Between Advertising and Sales," **Applied Economics**, 12 (September), 329-340.

Hanssens, Dominique M. (1980), "Market Response, Competitive Behavior, and Time Series Analysis," **Journal of Marketing Research**, 17, 4 (November), 470-485.